ULDB Balloon Vehicle and Recovery Systems

ULDB Balloon Vehicle & Recovery Systems Products

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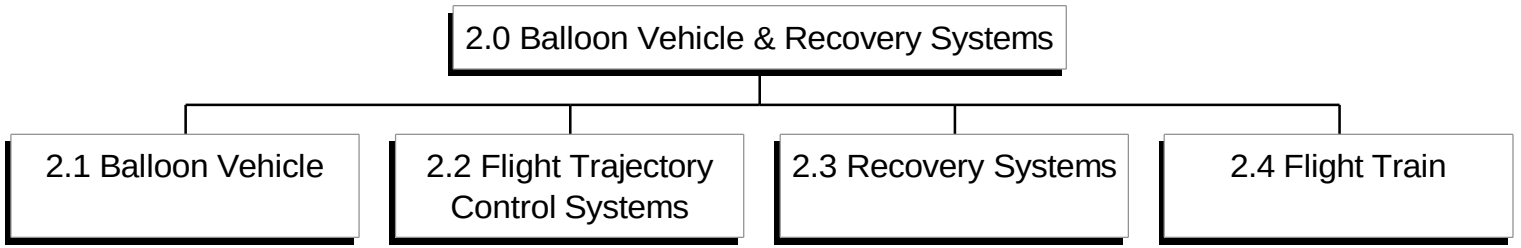
WALLOPS FLIGHT FACILITY



2.1 Balloon Vehicle	2.2 Flight Trajectory Control Systems	2.3 Recovery Systems	2.4 Flight Train
Simpson	Simpson	Shreves	Simpson

ULDB Vehicle and Recovery Systems

- **Vehicle Structure**
  - **Main Envelope**
  - **Special Structural Elements**
- **Flight Trajectory Control Systems**
  - **Altitude Control Element**
  - **Ground Track Control Element**
- **Recovery Systems**
  - **Descent Element**
  - **Impact/Containment Elements**
- **Flight Train**
  - **Load Support/ Separation Element**
  - **Torque Transfer Element**

2.1 *Vehicle Structure*

- **Functional Requirements [drivers]**
  - **Loft and maintain 'balloncraft', recovery system and other support elements for up to 100 days Non Polar [Science, Mission, HQ]**
  - **Achieve minimum float altitudes of 110,000' (33.5 km) to 115,000' (35 km) [HQ, Science]**
- **Target Design-to Requirements**
  - **Suspended Science Weight to 2200 lb. (1000 kg)**
  - **Total Suspended Weight to 3500 lb. (1600 kg)**
  - **Minimum Float Altitude >= 115,000'**

Vehicle Science Weight Requirements

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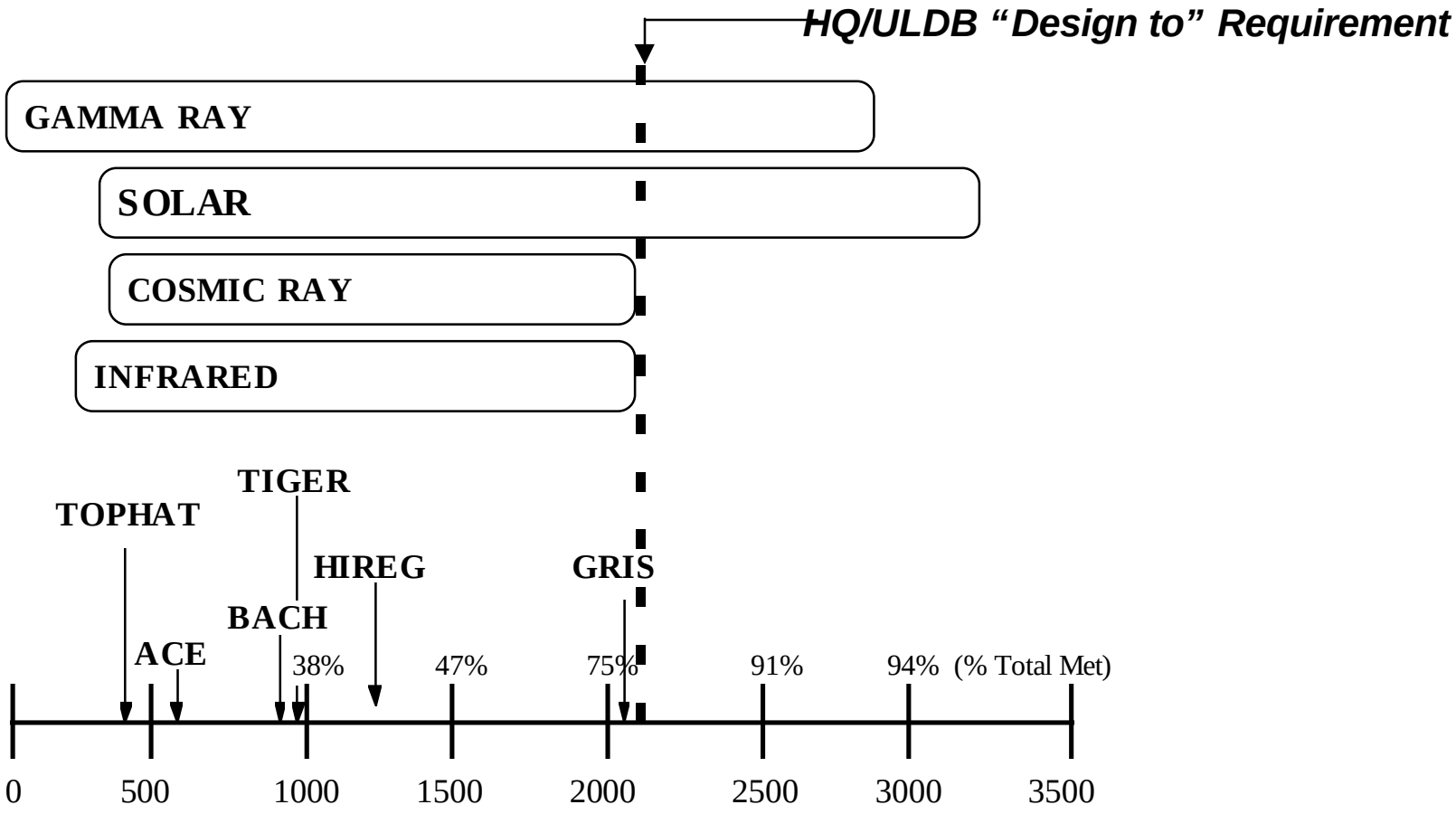

Vehicle Minimum Altitude Requirements

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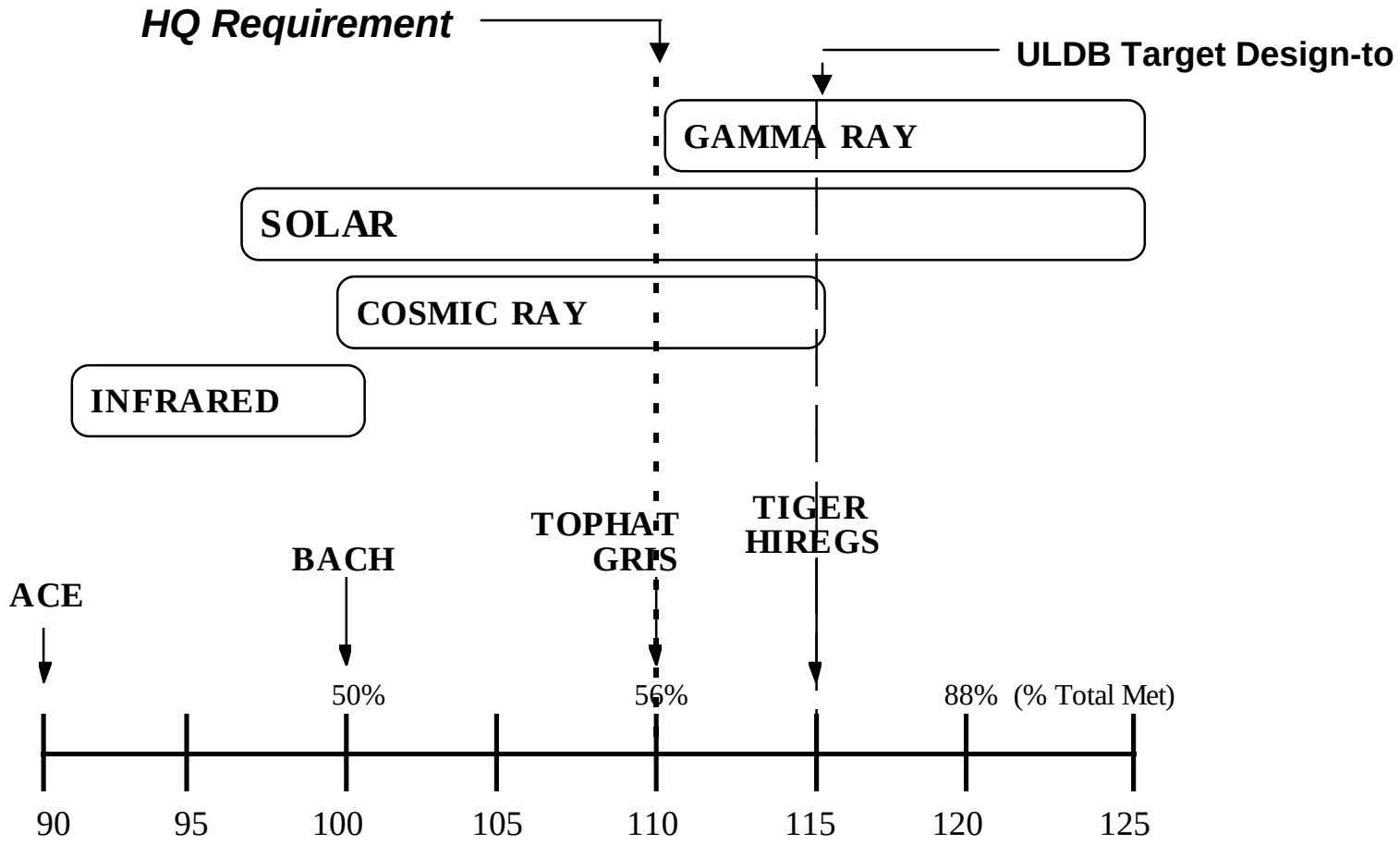

Minimum Altitude Requirement (k feet) [ITMI 4/97]

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Vehicle Structure

- **Leading Design Concepts**
  - **Large Super Pressure Balloon**
  - **Anchor Balloon System**
  - **Gas Temperature Control**
- **Technology Development**
  - **Balloon Vehicle Technology Development Research Project**
    - » **Super Pressure Design**
    - » **Materials Development**
    - » **Flight Tests**

2.2 *Flight Trajectory Control Systems*

- **Requirements [drivers]**
  - **Altitude Control [Mission, Science]**
  - **Latitude Drift Control [Mission, Science]**
- **Target Design-to Requirements**
  - **Control Diurnal Altitude Variation to <= 10,000' (3 km)**
  - **Control Latitude Drift Variation to <=+/- 20 deg over mission**
- **Leading Design Concepts**
  - **Altitude**
    - » **Anchor Balloon**
    - » **Gas Temperature or Pressure Control**
  - **Ground Track**
    - » **Tethered Drag Body**
    - » **Propulsion**

Altitude Control - Science Requirements

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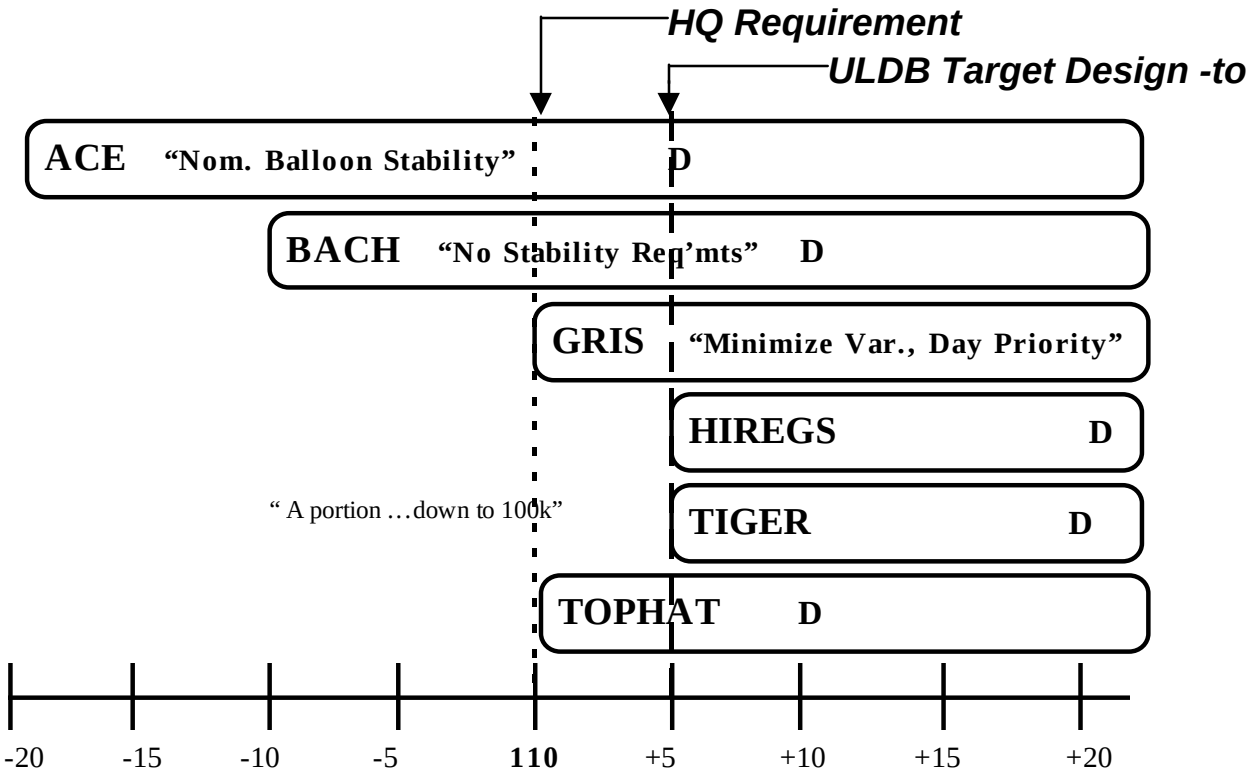

Altitude Control Requirement (k feet) SUR, Gregory

Latitude Control - Science Requirements

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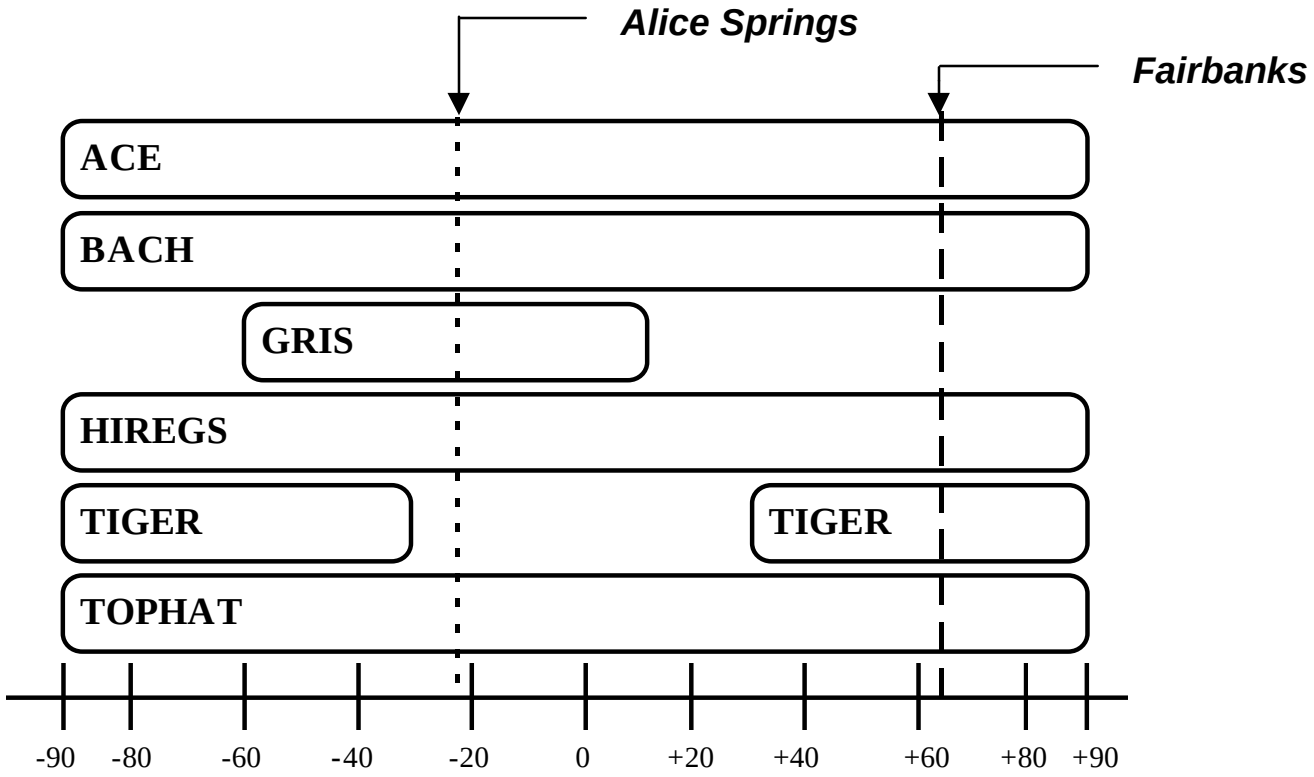

Latitude Control Requirement (k feet) SUR, Gregory

2.2 *Flight Trajectory Control Systems*

- **Technology Development**
  - **Multiple Altitude Control Systems**
  - **Multiple Ground Track Control Systems**

2.3 *Recovery System*

- **Requirements [drvs]** ***Note: No Science Req'mts***
  - **Safely Return Gondola to Surface [Mission]**
  - **Safely Return Balloon Envelope to Surface [Mission]**
- **Target Design-to Requirements**
  - **Minimize Payload Damage**
  - **Provide Water/Land Recovery**
- **Leading Design Concepts**
  - **Use Current Capability with Terminate Planning**
  - **Autonomous Steerable Packed Parafoils**
  - **Inflatables for Impact Shock and Water Recovery**
- **Technology Development**
  - **Autonomous Steerables Applied to Balloon Mission**

2.4 *Flight Train*

- **Requirements [drivers]**
  - **Support Gondola Load, Provide Balloon/Gondola Separation [Mission]**
  - **Torque Transfer Mechanism [Science, Mission]**
- **Target Design-to Requirements**
  - **Gondola Load to 3500 lbs (1600 kg)**
  - **Torsional Stiffness TBD**
  - **Reduce Terminate Shock Load to <= 3g's**
- **Leading Design Concept**
  - **'Standard' Flight Train with**
    - » **New Materials**
    - » **Proven In-line Energy Absorbtion Techniques**